Abstract Submitted
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Rayleigh-Taylor Strength Experiments of the Pressure-Induced $\alpha \rightarrow \epsilon$ Phase Transition in Iron[1] JONATHAN BELOF, ROBERT CAVALLO, Lawrence Livermore National Laboratory, RUSSELL OLSON, Los Alamos National Laboratory, PETER VITELLO, DANA ROWLEY, Lawrence Livermore National Laboratory — HE-driven experiments to shocklessly cross the pressure-induced martensitic α (bcc) to ϵ (hcp) phase boundary in iron have been designed and preliminary data will be presented. The quasi-isentropic drive conditions result in peak pressures of 120-250 kbar and strain rates on the order of 10^6 sec^{-1}. The target samples under study have been fabricated containing a single-mode perturbation such that the resulting Rayleigh-Taylor growth may be measured using the 800 MeV proton radiography facility at LANL. Simultaneous Photon Doppler Velocimetry can provide insight into the EP/P1/P2/PIR waves and allows for validation of the high-explosive drive conditions. Having designed four distinct assembly geometries, the goal of the experiment is to measure the dynamic strength of the bcc/hcp phases accurately and to provide experimental data that will allow further development of material strength models for this classical system. With both RT growth factors and target velocimetry, we may infer the effects of material strength for not only $\alpha \rightarrow \epsilon$ iron, but also reverted $\epsilon \rightarrow \alpha$ iron containing the dislocations generated and stored from the ϵ phase.

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Jonathan Belof
Lawrence Livermore National Laboratory

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